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INSTRUMENT SHOP

INSTRUCTION MANUAL

Telonic

INDUSTRIES, INC

MODEL LH-1
LH-1M

SERIAL NO. A10240

PLUG IN OSCILLATOR

INSTRUMENT SHOP

TELONIC INSTRUMENTS AND ACCESSORIES

Products manufactured by TELONIC INDUSTRIES, INC. are guaranteed against defective materials and workmanship for a period of one year (vacuum tubes and semiconductors excepted) from date of purchase. This warranty does not apply to instruments that have been altered, improperly handled or damaged in any way beyond our control.

Instruments must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

CHANGES IN SPECIFICATIONS

The right is reserved to change the published specifications of equipment at any time, and to furnish merchandise in accordance with current specifications, without incurring any liability to modify equipment previously sold.

RETURNING EQUIPMENT TO FACTORY

Factory service is available for repair and readjustment of this instrument. However, a description of the trouble should be forwarded FIRST, whereupon instructions for correcting the trouble OR authorization for returning the equipment will be given. This applies to all units, whether under warranty or not.

MODEL LH-1
LH-1M

SERIAL NO. A10240

PLUG IN OSCILLATOR

Telonic INDUSTRIES, INC. BEECH GROVE, INDIANA

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CONVERSION INFORMATION

Commencing with equipment shipped after about July 22, 1963, certain modifications have been incorporated in the Telonic SM-2000 plug-in series, and in the Telonic SM-2000 control chassis. These modifications may render the units incompatible with those previously shipped unless the earlier instruments are modified also. The equipment in which these modifications have been made can be identified by the letter "A" prefixed to the serial number.

Units not so identified must be modified if they are to be compatible with instruments now being shipped. The modifications to be made are listed below, divided into two groups - those to be made to earlier SM-2000's and those to be made to earlier plug-ins.

SM-2000 CHANGES

1. On J601, remove all wires presently connected to pin 8 and reconnect them at pin 7; remove the jumper between pins 7 and 8.

2. Using shielded wire, type RG-174/U or equal, connect pin 8 of J601 to the printed circuit board land which leads to pin 1, V303. Ground the shield by connecting it to a convenient ground land nearby.

3. Prefix the letter "A" to the serial number of the instrument.

PLUG-IN CHANGES

1. On P601 remove all wires presently connected to Pin 8 and reconnect them at pin 7; remove the jumper between pins 7 and 8 if one is connected.

2. Prefix the letter "A" to the serial number of the instrument, if none is prefixed.

Changing the serial number of the instrument is as important in the modification as are the electrical requirements, as the ability to identify a unit as having been or not having been modified is involved.

SECTION I

SPECIFICATIONS

MODELS LH-1 and LH-1M

INTRODUCTION

The LH-1 is a plug-in sweep oscillator unit for use with designated Telonic Control Chassis. All the features of the controls chassis are utilized with this unit, including the sweep ratio and sweep rate functions.

The LH-1M includes a variable marker covering the entire sweep range. This difference is clearly indicated throughout the manual.

SPECIFICATIONS

CW AND SWEEP CENTER FREQUENCY RANGE	10Kc to 12Mc
SWEEP FREQUENCY RANGE	10Kc to 12Mc
SWEEP WIDTH	50Kc to 12Mc
OUTPUT VOLTAGE	0.35vrms into 50Ω
FLATNESS (100Kc to 12Mc)	0.5 db
LINEARITY	Better than 1:1.2
VERNIER LEVEL CONTROL RANGE	0-10 db
VARIABLE MARKER	
Frequency Range	0-12 Mc
Accuracy	± 100Kc

SECTION II

OPERATING INSTRUCTIONS

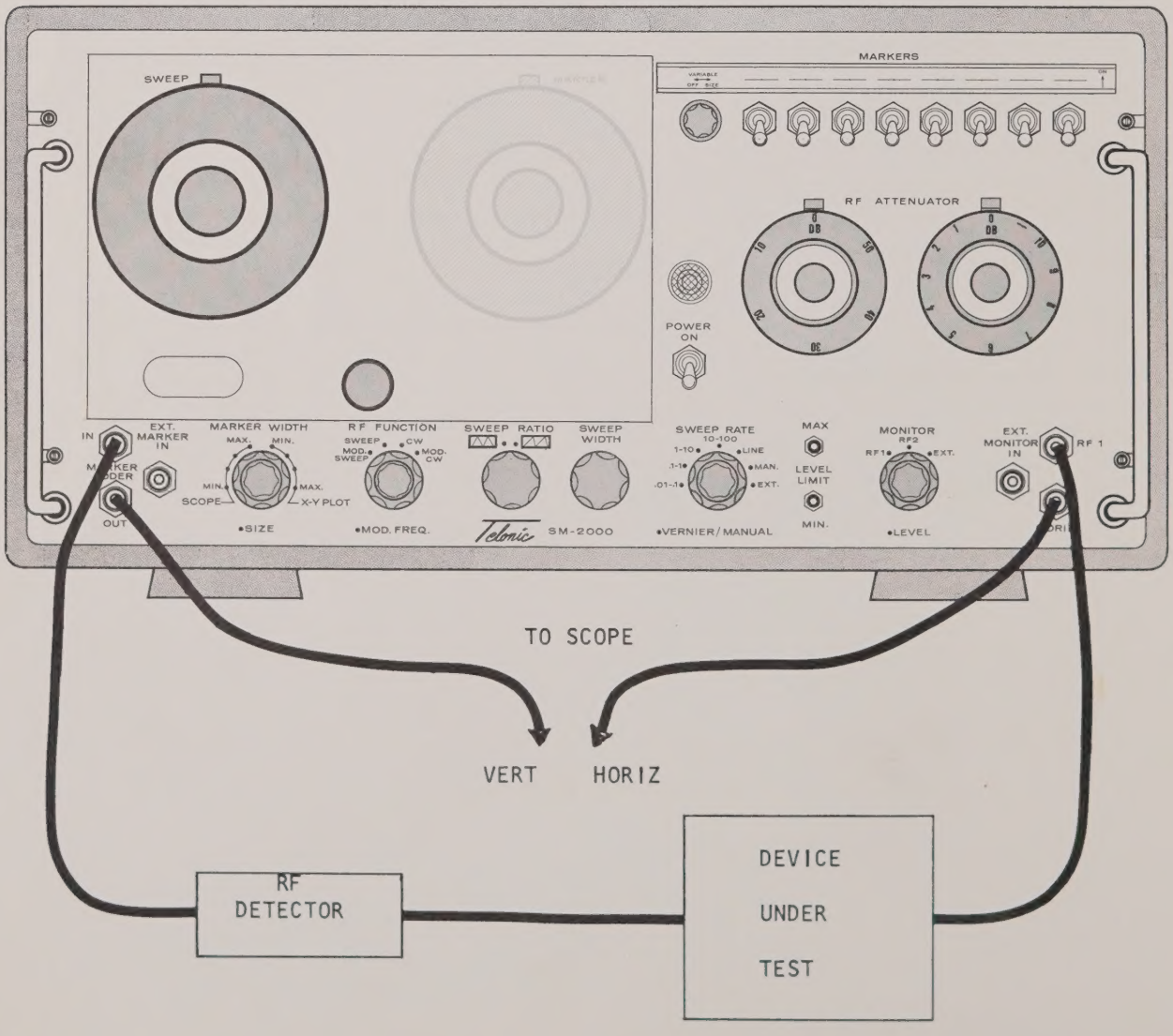
IMPORTANT NOTE

Before operating the LH-1, it is essential that the following control chassis voltages be adjusted to the exact values shown:

J601-28.....+70v (dc level) J601-5.....+100 vdc

With the LH-1, the +70v at J601-28 should be set using an accurate voltmeter with over 2 megohms input impedance. A high quality digital reading device is recommended.

TYPICAL SET UP



DESCRIPTION OF FRONT PANEL

The front panel contains two controls (one only if variable marker is not installed).

SWEEP — The Sweep Dial, which sets the center frequency of the sweep oscillator by varying centering current through a saturable reactor control winding.

MARKER — The Variable Marker Dial, calibrated to 12 Mc.

GENERAL

1. Make sure the control chassis power is OFF before inserting the plug-in oscillator into the control chassis. If the power is ON, transient voltages may damage diodes in the units. Insert plug-in oscillator and secure it in the chassis by tightening the fastening rod with the knob in the lower center of the front panel.

2. Make connections to the scope (or recorder), the device under test, and RF Detector as shown. All connectors located on the sweep generator are BNC type and it is recommended that RG cable be used for all connections.

3. Refer to the manual for the control chassis for additional instructions.

4. The LH-1M is ready to operate after a 15-minute warm up period; however, the stability of the saturable reactor is such that there will be about a 2Mc drift and a 1 Mc increase in sweep width over the first two hours. This will not interfere with normal operation except in the neighborhood of 12 Mc.

5. To insure proper operation of both units, refer to Section IV (CALIBRATION PROCEDURE) of both manuals.

6. At full sweep width the entire 0-12 Mc range is being swept, and the circuitry is such that the setting of the SWEEP Dial has no effect on the display.

7. Because of the saturable reactor hysteresis, the following procedure is recommended for best dial accuracy and lowest residual FM on switching from a SWEEP to a CW mode:

   a. Set the SWEEP Dial to the desired frequency.

   b. Reduce the control chassis SWEEP WIDTH to minimum.

   c. Switch to CW mode of operation.

NOTE

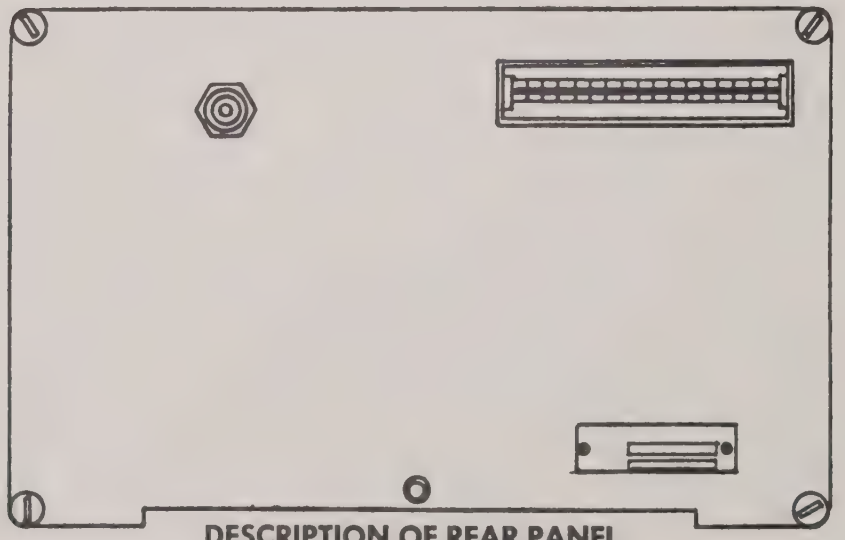
7. For the same reason, the actual frequency of CW settings is more accurately determined by a zero beat with the variable marker than by direct reading of the SWEEP Dial. For instance, to change CW frequency from 2Mc to 8 Mc, turn ON the variable marker and set it at 8 Mc. Set the SWEEP Dial for a zero beat with the variable marker signal, then turn the variable marker OFF.

8. Proceed in accordance with the recommendations of the manufacturer of the device under test concerning alignment, adjustment, and tests.

9. To operate the LH-1 at frequencies below 100 Kc, the MONITOR Selector Switch on the control chassis should be set in the RF 2 or EXT position to disable the leveler circuit. At frequencies lower than 100Kc, the leveler circuit will attempt to follow individual RF cycles, rather than peaks only, resulting in distortion or breakup of the RF output. This results from the negative feedback action of the leveler which lowers oscillator anode voltages on the positive output half cycles, tending to cause oscillation to cease, and to raise the voltages on the negative half cycles.

*The Telonic XD-3A or XD-8A is suitable for this use in a 50Ω system.

PICTURE OF REAR PANEL



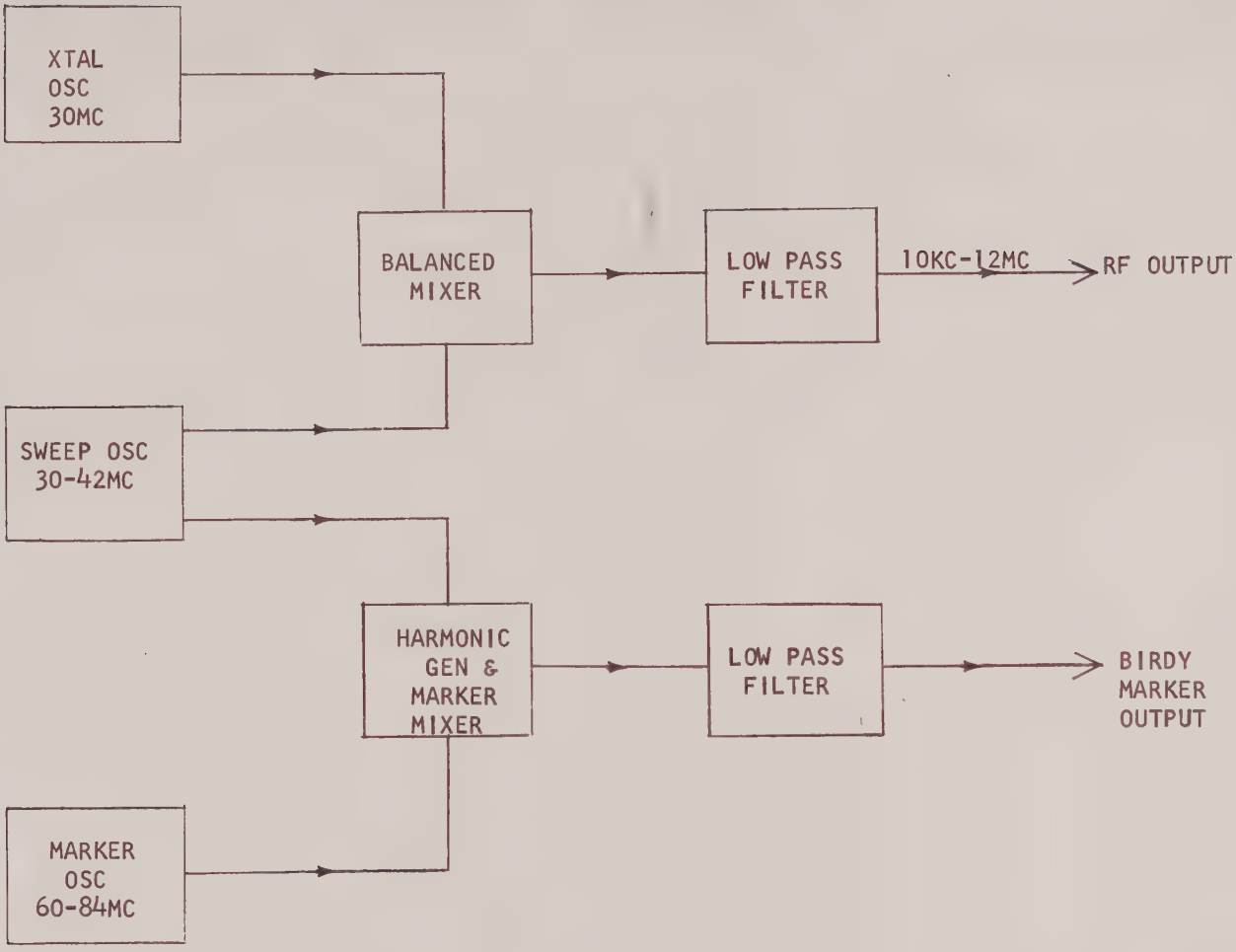
DESCRIPTION OF REAR PANEL

The two electrical connectors on the rear panel are:

A BNC plug, which mates with a BNC jack on the control chassis. This is the RF output connector.

A 32-contact plug which makes the other electrical contacts necessary through a mating jack on the control chassis.

SECTION III .. GENERAL DESCRIPTION



BLOCK DIAGRAM

GENERAL

The LH-1 plug-in oscillator has an RF output derived from heterodyning signals from a push-pull sweep oscillator and a crystal-controlled Colpitts-type oscillator operating at 30 Mc.

The variable marker (optional) is produced by a signal from a tunable Butler oscillator. The LH-1M is identical with the LH-1 except that it contains a variable marker.

SWEEP OSCILLATOR AND BUFFER

The sweep oscillator is a push-pull oscillator operating with inductive feed back, capacitively coupled to an untuned buffer stage. The buffer output is transformer coupled to a balanced mixer circuit and heterodyned with a 30 Mc crystal-controlled signal. Tuning is accomplished by varying the "centering current" through the control winding of a saturable reactor. The current is varied electronically around the center value set by the SWEEP Dial to provide a swept output. The sweep oscillator operates from about 29Mc to about 44Mc.

CRYSTAL OSCILLATOR AND BUFFER

The 30 Mc crystal oscillator is a modified Colpitts circuit, with a resonant crystal feed back. The 30 Mc signal is capacitively coupled to a tuned buffer stage. The buffer output is transformer coupled to the balanced mixer and heterodyned with the swept signal.

BALANCED MIXER AND LOW PASS FILTER

The balanced mixer circuit includes four diodes for efficient heterodyne action. Fundamental and sum frequencies are rejected by a four-section LC pi-type low pass filter which cuts off above 12 Mc but far below 30 Mc. The difference frequency, in the 10 Kc - 12 Mc range, is capacitively coupled to the output connector.

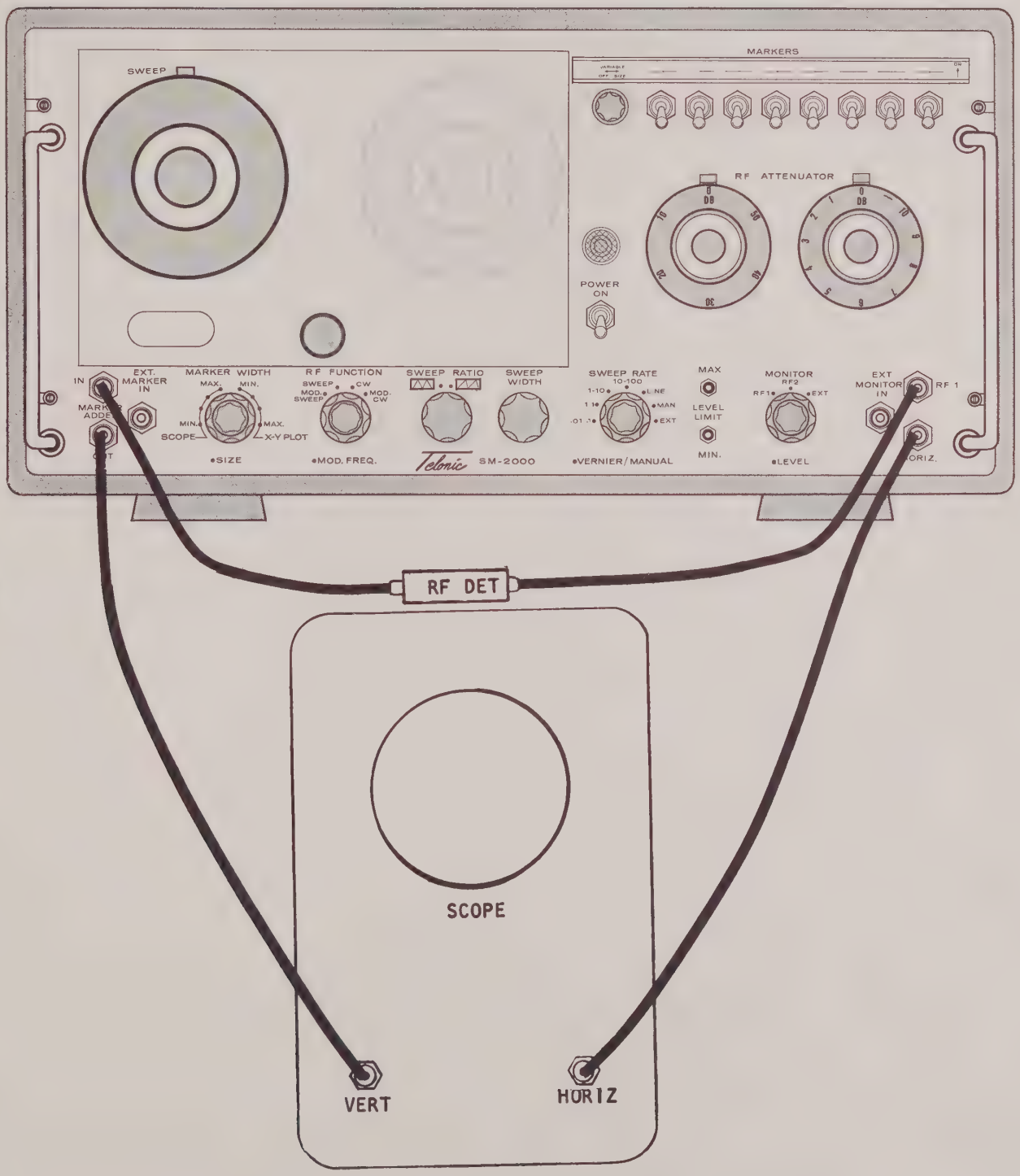
VARIABLE MARKER

The variable marker is produced by heterodyning the output of a 60-84 Mc tunable marker oscillator with the second harmonic of the swept signal. The harmonic generatio is provided by the non-linear action of the diodes in the marker mixer, to which a sample of the swept output is capacitively coupled.

The MARKER Dial is calibrated over the 0-12 Mc range. The marker oscillator is a grounded-grid Butler circuit with the feed back through a cathode follower stage to the cathode of the oscillator.

The marker oscillator output is coupled through radiation and stray circuit reactance to the marker mixer where a birdy is produced. The birdy is dc-coupled through a one-section low-pass filter to the birdy-by-pass marker system on the control chassis. See block diagram for further explanation of the manner in which the various signal frequencies combine to produce the heterodyne output and the birdy marker.

SECTION IV .. CALIBRATION PROCEDURE



TYPICAL SET UP

CALIBRATION PROCEDURE

GENERAL

The LH-1 should be recalibrated after changing any component, or at any time the calibration is noted to be incorrect.

Complete calibration of the LH-1 involves adjustment of three different classes of controls.

Those located in the LH-1 which affect the operation of the control chassis.

Those located in the LH-1 and affecting LH-1 functions only.

Those located in the control chassis which affect the operation of the LH-1.

The latter class of controls is discussed in the manual for the control chassis. The others are treated here.

NOTE: Although preliminary adjustments may be made with the cover removed from the oscillator section, final adjustment requires that the cover be in place.

If the LH-1M cannot be calibrated as outlined in this section, check the control chassis for proper calibration. See CALIBRATION PROCEDURE in the control chassis manual. Particular attention should be given the following adjustments:

B+2
B+3
J601-28 (20-120v driving waveform)
CENT MAX SWEEP WIDTH

TEST EQUIPMENT REQUIRED

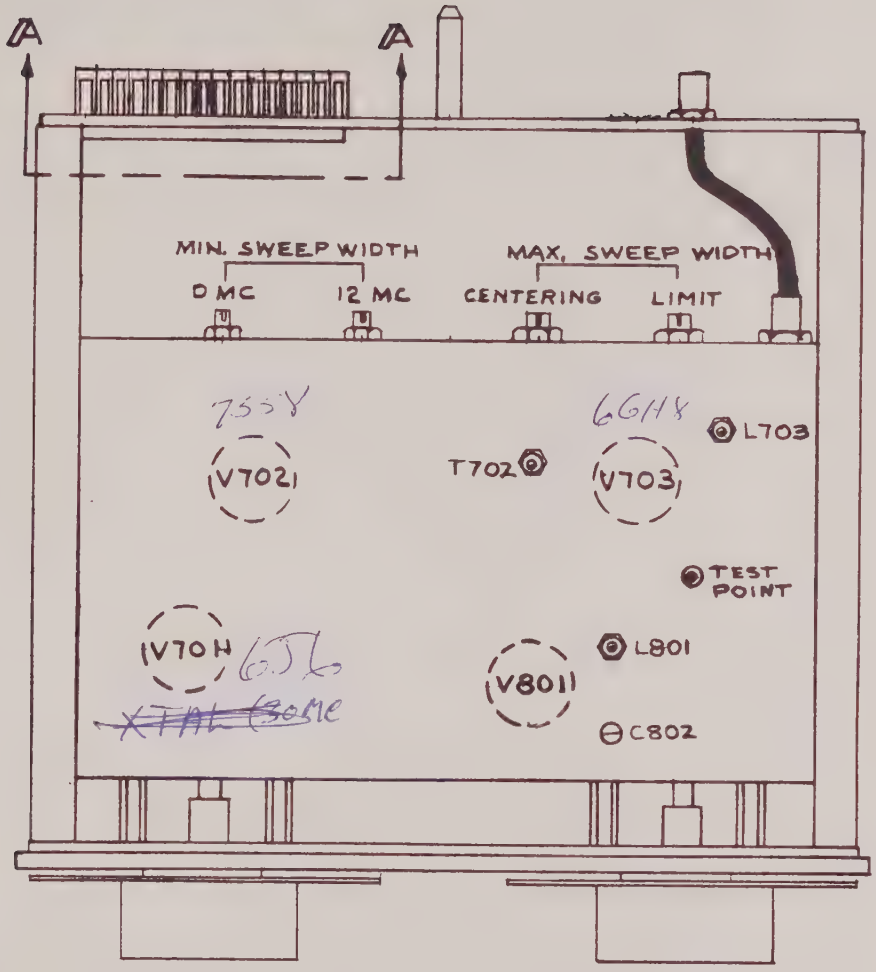
1Mc crystal-controlled harmonic marker (such as the Telonic CDH-1.0)
Calibrated RF detector (such as the Telonic XD-3A or XD-8A)
Oscilloscope
VTVM or 20kΩ/v voltmeter

PROCEDURE

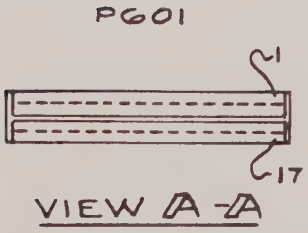
1. Make connections as shown.

2. Use double-shielded (RG) 50Ω cable for all RF connections to insure good connections and minimum radiation, and to avoid pickup of spurious signals. The detector must match the 50Ω cable, or a matching network must be used.

3. With power OFF, plug in the LH-1 and secure in place.



CHASSIS LAYOUT
TOP VIEW



VIEW A-A

4. Although the stability of the LH-1M will permit operation after a 15-minute warmup period calibration can best be accomplished after the unit has been on for a minimum of two hours. Full sweep width is not realized until after about this time, and the pattern also will be shifted to the right. The shift over the first 2-hour period is about 2 Mc.

30MC CRYSTAL OSCILLATOR

A test point is provided for easy adjustment of this circuit. See chassis layout on page 9 for location of this point. L703 is adjusted for near maximum negative voltage at this point. The correct adjustment for L703 is just below maximum on the low inductance (high frequency) side.

30MC BUFFER

Preset the following controls on the control chassis.

SWEEP WIDTH to maximum (fully clockwise)
RF LEVEL to maximum (fully clockwise)
MONITOR Selector to RF 2 (Not RF 1)
All markers OFF
RF ATTENUATOR to 0 db

Adjust T702 for maximum RF output. Return the MONITOR Selector to RF 1.

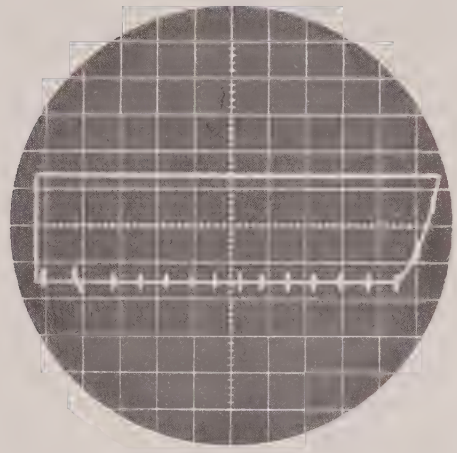
CENTERING

With other controls set as above, turn ON the 1Mc harmonic marker. Adjust CENTERING to position the "-1Mc" marker at the left edge of the pattern. The "-1Mc" marker is the one produced when the sweep oscillator is operating at 29Mc, or 1Mc below the crystal oscillator, and is the first one to the left of the easily recognized "zero point." See drawing of typical scope pattern at end of the SWEEP WIDTH adjustment procedure.

SWEEP WIDTH

With controls set as above, adjust LH-1M SWEEP ~~WIDTH~~ LIMIT so that the 12Mc marker is on the flat portion of the display representing the detected RF ~~output~~ AMP, so that the 13Mc and 14Mc markers are visible but are on the slanting right edge of the oscilloscop pattern.

Readjust both the CENTERING Control and the SWEEP WIDTH until the conditions prescribed for both adjustments are met.

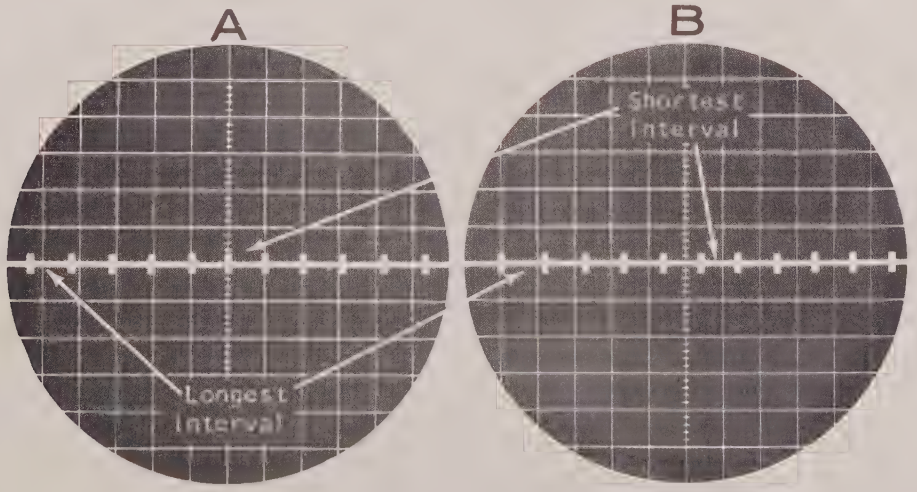


LINEARITY CHECK

Linearity measurements are made over the display at full sweep width.

With controls set as in 30MC BUFFER adjustment procedure, set the control chassis MARKER WIDTH Control to minimum. Adjust the horizontal position control on the oscilloscope so that the 6Mc marker is on the vertical center line.

Locate the shortest marker interval. Adjust the horizontal gain on the oscilloscope so that this interval occupies exactly one scale division on the oscilloscope. See Figure A below. Locate the longest marker interval in the swept range and readjust the horizontal position control to start this interval on a vertical graticule line. See Figure B below. Measure the longest marker interval. Its length (in scope divisions) indicates the linearity ratio: A length of 1.15 scope divisions for the longest marker interval represents a linearity of 1.15 to 1.



CALIBRATION PROCEDURE

0 MC

Leaving other controls set as above, rotate the control chassis SWEEP WIDTH Control to nearly the full counter-clockwise position and set the control chassis MARKER WIDTH and MARKER SIZE to maximum.

Set the LH-1 SWEEP Dial at 1Mc and adjust the "0 MC" Control to center the 1Mc marker on the display. Decrease the control chassis SWEEP WIDTH to minimum, maintaining the center of the marker in the center of the display with the "0 MC" Control. At minimum sweep width, the "wings" of the "birdy" marker may not be visible, and the gap between the wings may occupy the entire trace.

12 MC

Leave control chassis controls set as above. Rotate the LH-1 SWEEP Dial to 12Mc and set the "12MC" Control to position the center of the 12Mc marker on the display as was done above with the 1Mc marker.

Readjust the "0MC" and "12MC" Controls until the markers are correctly positioned each time the LH-1M SWEEP Dial is rotated to the 1Mc and 12Mc position.

MAX AND MIN LEVEL LIMIT (Control Chassis)

The procedure outlined in the control chassis manual for setting these controls is repeated here, with additional information peculiar to operation with the LH-1.

1. With the detector and scope still connected, and other controls set as at the conclusion of the SWEEP WIDTH adjustment, turn SWEEP WIDTH on control chassis fully clockwise and adjust the MAX LEVEL LIMIT for rated output at the frequency where output is lowest.

2. Insert fixed attenuation in an amount equal to the desired range of the LEVEL Control, not to exceed 10 db.

3. Note the level of the scope pattern.

4. Remove attenuation, rotate LEVEL Control fully counter-clockwise. Set MIN LEVEL LIMIT for same scope deflection as seen in Step 3.

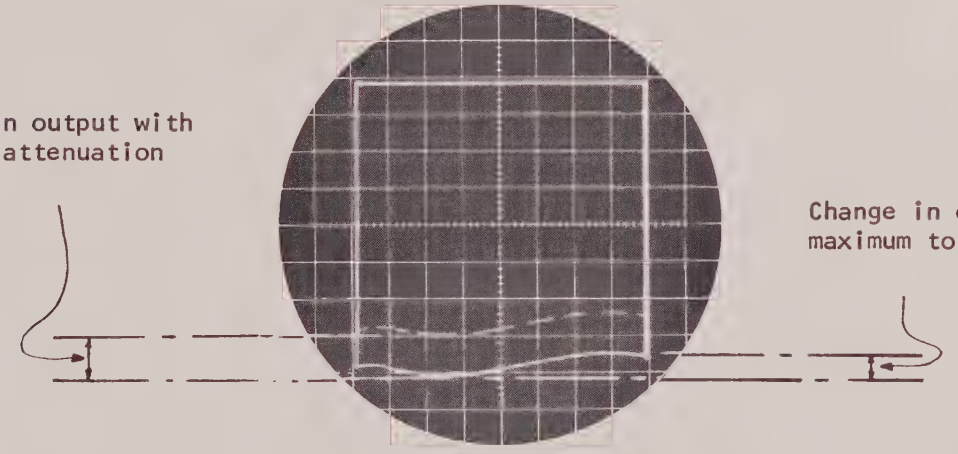
FLATNESS CHECK

Flatness is measured over maximum sweep width. At any center frequency setting, the minimum output at full sweep width must be no more than 0.5 db lower than the maximum.

1. With controls set as above, rotate the control chassis LEVEL Control fully clockwise; make sure the MONITOR Selector on the control chassis is in the RF 1 position.

2. Note the difference between maximum and minimum output levels.

3. Insert 1 db of attenuation and compare the reduction in output with the noted difference between maximum and minimum. The difference between maximum and minimum output must be no more than half the signal reduction caused by 1 db of attenuation.



LOW PASS FILTER (L704-707, C711-715)

This filter is adjusted at the factory for flat output and proper cutoff frequency and does not require readjustment.

VARIABLE MARKER

NOTE: The position of the "sticks" connected to CR801 and CR802 should not be disturbed. These are adjustable coupling capacitors for the marker oscillator signal, and are factory-adjusted for proper operation. If coupling is too strong, objectionable spurious markers may result. If coupling is too weak, the variable marker may change in amplitude considerably as it is tuned across the range.

CALIBRATION PROCEDURE

With controls set as above, reduce control chassis SWEEP WIDTH to near minimum and turn ON the variable marker.

Set the LH-1M MARKER Dial to the 1Mc position. Adjust L801 to superimpose the variable marker exactly over the harmonic marker at 1Mc.

Rotate the MARKER Dial to the 12Mc position. Adjust C802 to superimpose the variable marker over the harmonic marker at 12Mc.

Readjust these two controls as necessary until the variable marker is superimposed over the appropriate harmonic marker at each end as the MARKER Dial is tuned across the range.

SECTION V .. MAINTENANCE

GENERAL PROCEDURE

Since this model is a plug-in unit, many of the possible malfunctions of ths oscillator are the result of part failure in the control chassis. The connections at P601 of the plug-in and at J601 of the control chassis afford a convenient means of tracing the source of troubles to the oscillator or chassis.

In locating troubles which have been traced to the oscillator, application of the common rules of electronic maintenance, including a visual check for damage, open filaments, glowing anodes, shorted tuning capacitors, and charred resistors, is an obvious measure. All connectors, particularly P601 and J601, should be checked for cleanliness.

EXTENSION CABLE

For maintenance work requiring access to parts located on the under side of the plug-in, or in other areas not easily reached, an extension cable may be obtained from Telonic Industries, Inc. This cable, having the 32-contact plug on one end and the 32-contact jack on the other, allows the plug-in to be removed from the control chassis and operated on the bench.

ACCESS TO RF COMPARTMENT

There are four unlacquered screws on each cover to the RF compartment. Only these should be removed in taking off the cover.

The lacquered screws hold the shield in place and have nothing to do with securing the cover.

The following chart will be of service in deciding whether a trouble lies in the oscillator or control chassis. It is assumed that the above procedures

SYMPTOM	CHECK (on P601)
Weak or no output or unleveled output	DC voltage at Pin 31 with RF LEVEL fully clockwise.
No sweep width	1. Voltage waveform, Pin 14 to ground.
	2. Next - resistance between Pins 14 and 15, 28 and 2 30 and 4 with plug-in removed,
No variable marker	1. For birdy at Pin 17
	2. DC voltage at Pin 1

If the chart shows that the trouble probably is in the control chassis, refer to the Maintenance Section of the manual for that unit.

If the trouble appears to be in the plug-in, the following chart may be of assistance in localizing the failure:

SYMPTOM	CHECK
Weak or no output or unleveled output	V701, V702, V703, and associated circuitry. Continuity from Pin 31 of P601 to Pin 6 or 8 of V702.
No sweep width	Check R602 and L701.
No variable marker	Check V801 and associated circuitry, including sweep sample line. Change diodes in mixer circuit and check other mixer components.
Weak Marker	CR801, CR802. V801 and associated circuitry.
Spurious Markers	Check both mixer diodes and change if necessary. Be sure diodes are inserted with correct polarity.

have been applied and that the jumpers on P601 are intact. Where "inconclusive" is shown, the next step should be followed.

IF RESULT IS	TROUBLE PROBABLY IN OSCILLATOR	CONTROL CHASSIS
High 100-175v	X	
Low or zero 0-100v		X
Sawtooth or triangular waveform	X	
0V or DC voltage	Inconclusive.	See Check #2.
Open on any check	X	
Continuity		X
Birdy present		X
No birdy	Inconclusive.	See Check #2.
100V	X	
Low or no voltage		X

PART VALUE INFORMATION

SCHEMATIC PART DESIGNATION

C Capacitor
CR Crystal Rectifier, Germanium Diode
J Jack
L Inductor
P Plug
R Resistor, Fixed or Variable
V Tube

SCHEMATIC VALUE ABBREVIATION

Ω ohms
K 1,000 ohms
M 1,000,000 ohms (megohms)
µf Microfarad
µµf, pf Picofarad
µh Microhenry
mh Millihenry

OTHER ABBREVIATIONS

F.P. Front Panel
R.P. Rear Panel
T.P. Test Point

RESISTORS - All resistors are 1/2 watt, ± 10%, and are shown in ohms, unless otherwise specified.

CAPACITORS - All capacitors are shown in picofarads (pf) unless otherwise specified.

COILS - All inductors are shown in microhenries (µh) unless otherwise specified.

CIRCUIT REFERENCE SYMBOL - LOCATION INFORMATION

601 - 699 Interconnecting elements
701 - 799 Sweep Oscillator
801 - 899 Variable Marker

* Indicates value of component adjusted at factory, and may deviate from value shown on print.

SECTION VI .. PARTS LIST

CIRCUIT REFERENCE	DESCRIPTION	TELONIC PART NO.
C601	CFC,470pf, ±10%, 1000VDCW	C-18
C602	Same as C601	
C701	CFC, 15pf, ±10%, 1000VDCW	C-7
C702	CFC, 1000pf, GMV, 1000VDCW	C-19
C703	Same as C702	
C704	CFC, 120pf, ±10%, 1000VDCW	C-14
C705	Same as C702	
C706	CFC, 25pf, ±10%, 1000VDCW	C-9
C707	Same as C701	
C708	CFC, 100 pf, ±10%, 1000VDCW	C-13
C709	CFC, 5pf, ±10%, 1000VDCW	C-4
C710	CFC, 10pf, ±10%, 1000VDCW	C-6
C711	Same as C704 (SC)	
C712	CFC, 350pf, ±10%, 1000VDCW (SC)	C-17
C713	Same as C712 (SC)	
C714	CFC, 330pf, ±10%, 1000VDCW (SC)	C-113
C715	Same as C704 (SC)	
C716	CFMY, 0.68µf, ±10%, 100VDCW	C-114
C717	CFCF, 1000pf, +100%-0%, 500VDCW	C-110
C718-726	Same as C717	
C727	CFCF, 100pf,	C-46
C728-738	Same as C717	
C739	Same as C701	
C740	Same as C701	
C741	Same as C709 (SC)	
CR701	DSD, 1N34A	D-2
CR702	Same as CR701	
CR703	Same as CR701	
CR704	Same as CR701	
J701	RJ, 4234-1	J-50
P601	Plug, 32-contact	S-39
P701	PC, UG-88B/U	J-32
P702	RJ, 4961-1	J-27
L701	Reactor, saturable	09114
L702	IF, 10µh, ±10%	L-107
L703	IV	09115
L704	IF, 1.0µh	L-102
L705	IV	L-41
L706	Same as L705	
L707	IV	L-42
L708	IF, 2.2µh, ±20%	1-100
L709	IF, 55µh	L-108
L710	Not assigned	
L711	Same as L708	
L712	Same as L708	
L713	Same as L708	
L714-L719	Same as L704	
L720	IF, 0.68µh, ±15%	L-103
R601	RVC, 100KΩ, 2W	R-774
R602	RVC, 250KΩ, ±20%, 2W	R-773
R603	RVC, 500Ω, 2W	R-775
R604	RVC, 10KΩ, ±20%, 2W	R-772
R605	Same as R604	
R606	RFC, 100KΩ, ±5%, 1/2W	R-111
R607	RFC, 39KΩ, ±5%, 1/2W	R-112
R608	RFC, 220Ω, ±10%, 1/2W	R-39
R609	RFC, 100KΩ, ±10%, 1/2W	R-28
R610	Same as R609	
R611	RFC, 82KΩ, ±10%, 1/2W	R-107
R612	RFC, 3.3KΩ, ±10%, 1/2W	R-70
R613	RFC, 150KΩ, ±10%, 1/2W	R-98
R614	RFC, 2.2KΩ, ±10%, 1/2W	R-20
R701	Same as R614	
R702	RFC, 47KΩ, ±10%, 1/2W	R-27
R703	RFC, 100Ω, ±10%, 1/2W	R-15
R704	RFC, 15KΩ, ±10%, 1/2W	R-66
R705	RFC, 4.7KΩ, ±10%, 1/2W	R-21
R706	RFC, 27KΩ, ±10%, 1/2W	R-25
R707	RFC, 10KΩ, ±10%, 1/2W	R-23
R708	Same as R706	
R709	Same as R706	
R710	Same as R705	
T701	Transformer, RF	09116
T702	Transformer, RF	09117
V701	TE, 6J6	VT-7
V702	TE, 7558	VT-45
V703	TE, 6GH8	VT-46
Y701	Quartz, crystal, 30Mc	X-2-30Mc

CIRCUIT REFERENCE	DESCRIPTION	TELONIC PART NO.
	MISCELLANEOUS	
	Socket, crystal	S-18
	Holder, semiconductor diode (4 required)	S-9
	Feed-thru, insulated (5 required)	MP-87
	Plug, 32-contact	S-39
	Socket, tube, 9-pin (2 required)	S-31
	Socket, tube, 7-pin	S-32

VARIABLE MARKER PARTS
(LH-1M ONLY)

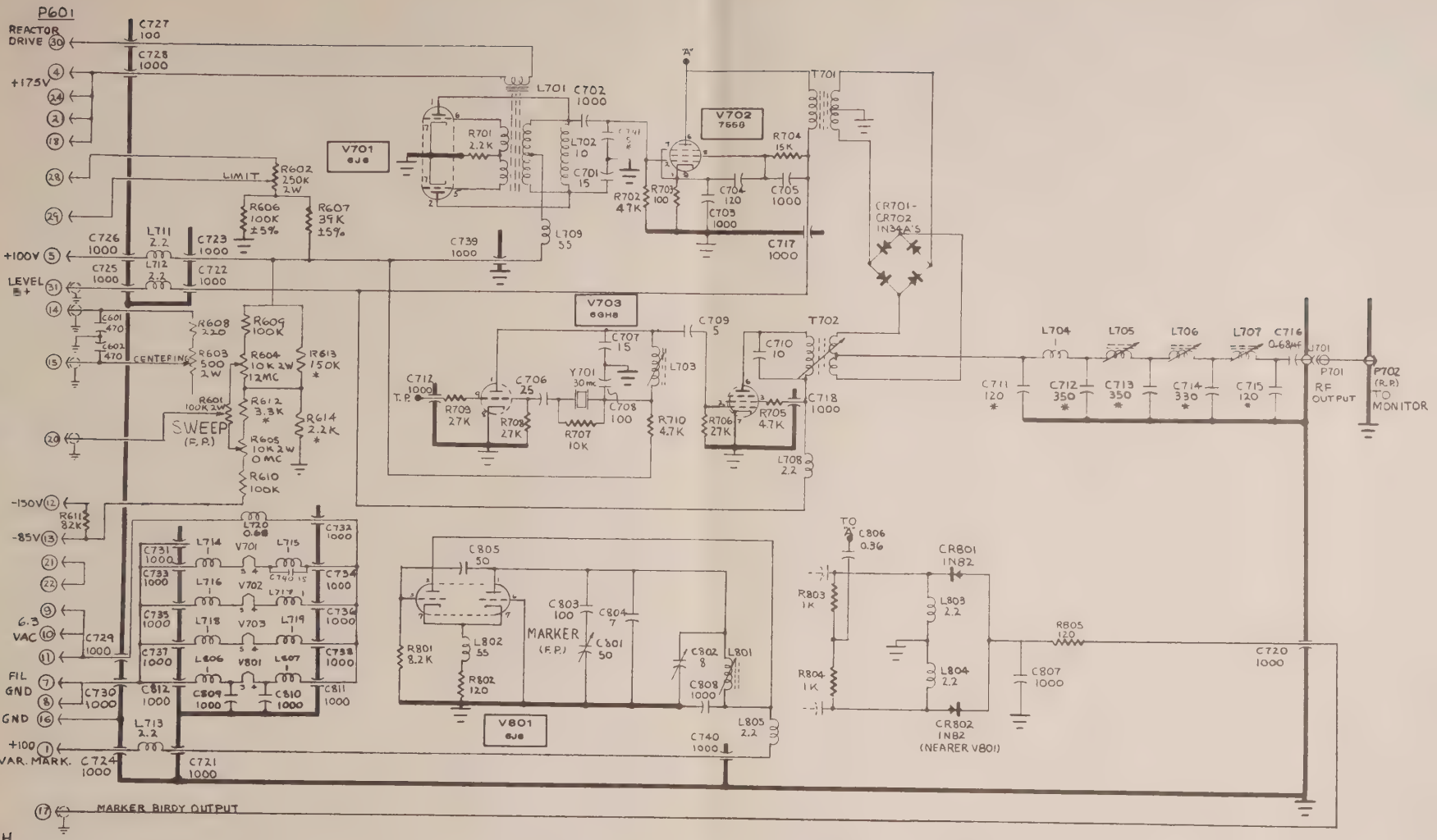
CIRCUIT REFERENCE	DESCRIPTION	TELONIC PART NO.
C801	CVC, 50-6.3pf	C-408
C802	CFT, 0.8-8.5pf	C-409
C803	CFC, 100pf, ±10%, 1000VDCW	C-13
C804	CFC, 2pf, ±5%, 1000VDCW	C-5
C805	CFC, 50pf, ±10%, 1000VDCW	C-11
C806	CFN, 0.36pf, ±10%, 500VDCW	C-30
C807-C810	CFC, 1000pf, GMV, 1000VDCW	C-19
C811	CFCF, 1000pf, +100%-0%, 500VDCW	C-110
C812	Same as C811	
CR801	DSD, 1N82A	D-1
CR802	Same as CR801	
L801	Inductor, variable	09118
L802	IF, 55µh	L-108
L803	IF, 2.2µh, ±10%	L-100
L804	Same as L803	
L805	Same as L803	
L806	IF, 1.0µh	L-102
L807	Same as L806	
R801	RFC, 8.2KΩ, ±10%, 1/2W	R-43
R802	RFC, 120Ω, ±10%, 1/2W	R-16
R803	RFC, 1KΩ, ±10%, 1/2W	R-18
R804	Same as R803	
R805	Same as R802	
V701	TE, 6J6	VT-7
	MISCELLANEOUS	
	Holder, semiconductor diode (2 required)	S-9
	Feed-thru, insulated (4 required)	MP-87
	Socket, tube, 7-pin (1 required)	S-32

ABBREVIATION CODE

CFC	Capacitor, fixed, ceramic
CFCF	Capacitor, fixed, ceramic feed-thru
CFMY	Capacitor, fixed, Mylar
CFN	Capacitor, fixed, composition
CFT	Capacitor, fixed, trimmer
CVC	Capacitor, variable, ceramic
DSD	Diode, semiconductor device
IF	Inductor, fixed
IV	Inductor, variable
PC	Plug, cable
RFC	Resistor, fixed, composition
RJ	Receptacle, jack
RVC	Resistor, variable, composition
SC	Subject to change
TE	Tube, electron

SECTION VII

SCHEMATIC DIAGRAMS

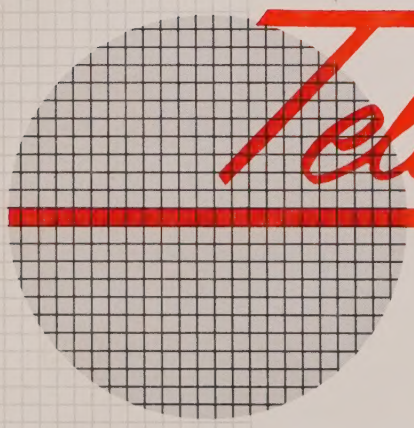

P601
REACTOR DRIVE
+175V
LIMIT
+100V
LEVEL B+
CENTERING
SWEEP (F.P.)
-150V
-85V
6.3 VAC
FIL GND
GND
+100 VAR. MARK.
MARKER BIRDY OUTPUT
V701 6J8
V702 7668
V703 6GH8
V801 6J8
MARKER (F.P.)
T701
T702
CR701-CR702 IN34A'S
CR801 IN82
CR802 IN82 (NEARER V801)
P701 R.F. OUTPUT
P702 (R.P.) TO MONITOR
TO "A"

71LH
12/62

PRODUCTION CHANGES
TELONIC MODEL LH-1/LH-1M

The following changes to this equipment are effective with units shipped on or after effective date shown.

CIRCUIT OR FEATURE	CHANGES	EFFECTIVE DATE
Wiring of P601	Remove connection at pin 8	April 22, 1963
Wiring of P601	Connect adjustable-value ceramic capacitor from pin 8 to pin 31 if necessary to prevent squibbulation	July 31, 1963



Telonic INDUSTRIES INC.

BEECH GROVE, INDIANA